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TITLE

LED ILLUMINATOR

INVENTORS

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LED ILLUMINATOR

PRIORITY

[0001] This application claims priority from U.S. Provisional Patent Application Serial Number 60/432,133 filed December 10, 2002.

FIELD

[0002] The present invention pertains to illuminators used for providing visibility to interior spaces within the body of a human being or an animal (hereinafter "animal").

BACKGROUND

[0003] Advances in fiberoptic technology in recent years have had a major impact on the ability of physicians, to include veterinarians, to either examine or perform procedures within the body of an animal. An example of a procedure within the body of an animal is an operation to either repair a defect or to treat a disease within the eye.

[0004] One example of a prior art illuminator is marketed by the assignee of the instant application under the Accurus® brand. The Accurus® illuminator utilizes a halogen lamp located at a console to generate light. The light at the console is focused and launched into a disposable fiberoptic probe. The disposable fiberoptic probe provides a path for the light produced by the halogen lamp as the light travels from the console into the posterior chamber of the patient's eye, where the light is used to illuminate an area of interest; for example, during vitreoretinal surgery.

[0005] Prior art illuminators used in surgery in the posterior of an eye consist of relatively large, inefficient light sources. These prior art illuminators typically require special power sources and generate wasted heat. The allocation of electrical power, cooling, and space within a console to support prior art illuminators adds to the cost of the console. In addition, prior art console-supported illuminators require routine changing of light bulbs.

[0006] Accordingly, there remains a need in the art for a low cost illuminator which makes efficient use of electrical power, generates a minimal amount of heat, and does not require routine changing of light bulbs.

SUMMARY OF THE INVENTION

[0007] The low cost illuminator of the present invention makes efficient use of electrical power, generates a minimal amount of heat, and does not require routine changing of light bulbs.

[0008] The disclosed illuminator includes a handle, a cannula extending from the handle, and a light emitting diode (LED) mounted on the end of the cannula. Control over the operation of the LED is effected either by a wire connection to a console containing the required electronic componentry or a wireless connection between a transmitter in a console and a receiver in the handle portion of the illuminator.

[0009] The disclosed LED illuminator provides the following advantages:

1. The single use handheld probe, including the handle, the cannula, and the LED, of the illuminator is disposable, inexpensive, and easy to manufacture.
2. The console requires less interior space to support the illumination function. The elimination of the need for the console to contain an incandescent or arc

lamp lowers the temperature (cooling) requirements of the console and makes the overall design of the system simpler, less expensive, and more reliable.

3. Illumination of interior spaces within the body of an animal with different lighting characteristics is possible simply by changing disposable probes containing different LED's. When different lighting is needed for different applications, different LED's may be made a part of the single use handheld probe.

4. LED's are energy efficient and produce very little heat. Therefore, the overall operating temperature of the equipment (console and handheld probe) will be much lower.

5. Wires (if used) are more flexible than fiberoptic cable. This flexibility affords more manageable cable maintenance in the sterile field during setup and during use.

6. The wireless battery operated configuration eliminates the requirement for setup and the need for cable management which provides the maximum maneuverability for the physician or veterinarian.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0010] A better understanding of the LED illuminator of the present invention may be had by reference to the drawing figures, wherein:

[0011] Figure 1 is a schematic view of a first embodiment of the present invention;

[0012] Figure 2 is a schematic view of a second, wireless embodiment.

DESCRIPTION OF THE EMBODIMENTS

[0013] As may be seen by reference to Figures 1 and 2, the illustrated embodiments of the LED illuminator **10, 110** of the present invention provide an alternate method of illumination in which an LED **20** provides the source of illumination instead of the halogen lamp used in prior art illuminators. The small size and low operating temperature of presently available LED's enables the light source to be located on the end of the cannula **30** of the handheld probe assembly **15**, as opposed to locating the light source in the console and conducting the light to the handpiece with a fiber optic cable. The end use functionality of the LED illuminator disclosed herein is at least as broad as the halogen illuminator. However, because the console assembly used with the disclosed LED illuminator is much lower in cost, and because the handheld probe assembly **15** is easier to manipulate due to the obviation of the light fiber from the console to the handheld probe **15**, the disclosed LED illuminator will find greater utility than prior art halogen illuminators.

[0014] In the embodiments of the LED illuminator **10, 110** disclosed in Figures 1 and 2, the light emitting diode **20** is mounted directly at a first end **32** of the cannula **30**. The first end **32** is sized and shaped depending on the size and shape of the space into which it is to be inserted. Such location enables placement of the illumination source in small cavities within the body of an animal, such as the posterior eye chamber, when the disclosed LED illuminator is used for a procedure within the animal such as eye surgery. The second end **34** of the cannula **30** provides for mounting in the hollow handle **60**. As shown in Figure 1, the electrical power to the LED **20** is provided from the console **40** via two thin wires **50.** Alternatively, as shown in Figure 2, electrical power may be provided by a battery **45** located in the handle **60** portion of the handheld probe assembly **15**. When wires **50** are used

between the console **40** and the handle **60**, altering the current or electrical signal in the wires connecting the handle **60** to the console **40** controls the LED **20** brightness. In the wireless embodiment shown in Figure 2, LED brightness would be controlled via a wireless interface between a transmitter **43** at the console **40** and a receiver **47** contained within the handle **60**. Signals from the receiver **47** pass through a digital analog converter **51** on their way to the LED **20**.

[0015] Because LED's are available with many different hues or color content, the use of different LED's is facilitated by the single use or disposable nature of the handheld probe assembly **15.** Such flexibility allows for the use of an LED mounted in a small dome or a surface mount LED.

[0016] The LED illuminators **10, 110** described herein maintain the functionality of prior halogen lamp illuminators, but provide more flexibility to the user for probe manipulation and light filtering. If a disposable cannula **30** is used, a new LED "bulb" is provided for each use of the disposable handheld probe assembly **15**.

[0017] The operation of the present invention is similar to prior art halogen light illuminators, with the exception of the setup procedure. For example, the LED illuminator of the present invention would require plugging in an electric cable connector, as opposed to the light pipe connector. The battery operated illuminator would need to be turned on by a switch located on the handle itself and then controlled by the console.

[0018] While the present invention has been disclosed according to the preferred embodiment of the invention, those of ordinary skill in the art will understand that other embodiments of the invention have also been enabled by the foregoing disclosure. Such other embodiments shall fall within the scope and meaning of the appended claims.